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Quartz Rotation Sensor

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A new high-precision ground- or platform-rotation sensor called the Quartz Rotation Sensor (QRS) has been developed and tested. The QRS is a mechanical angular accelerometer that senses rotational torque with an inherently digital, load-sensitive resonant quartz crystal. It is a portable broadband sensor with a noise floor measured to be ≈ 45 pico-radian/root (Hz) near 1 Hz, and a resonant period of ~ 10 s. The noise floor of the sensor near 0.1 Hz is more than two orders of magnitude lower than other similarly sized instruments enabling a dramatic improvement in ability to measure rotational teleseismic signals and tilt contamination in horizontal seismometers. We will present details of the sensor and measurements of rotational components of teleseismic waves recorded with the sensor at a vault. The QRS is useful for rotational seismology and for improving low-frequency seismic isolation in demanding applications such as the Laser Interferometer Gravitational-Wave Observatories.